Re-presenting Pingpu Culture: A Research on the AR Virtual Reality Tour of Liuchong Creek's Tribal Village in Taiwan

Li- Hsun Peng[1*], Yu-Ping Lin[2] and Thi Minh Kieu Tran[3]

1 Department of Creative Design, National Yunlin University of Science and Technology, Taiwan
2 Master Program, Department of Creative Design, National Yunlin University of Science and Technology, Taiwan.
3School of Textile-Leather and Fashion, Hanoi University of Science and Technology.
01 Dai Co Viet, Hai Ba Trung District, Hanoi. (Vietnam)

penglh@gemail.yuntech.edu.tw

Abstract. This study explores the application of AR virtual reality technology to address challenges in Taiwan's indigenous tribal villages, focusing on Liuchong Creek's tribal village. The research aims to enhance cultural inheritance, community participation, and tourism development. Three main questions guide the study: selecting and presenting cultural elements, designing and implementing a suitable AR virtual reality tour system, and evaluating its impact.The study employs qualitative and quantitative methods across three stages. The first involves a literature review, field investigation, and interviews with villagers to understand their needs. The second stage focuses on system design and development, incorporating essential cultural elements into an interactive AR virtual reality tour system. The third stage tests and evaluates the system's usability, acceptability, and benefits through user feedback and behavior analysis.Expected contributions include providing an innovative approach to utilizing AR technology for cultural inheritance and tourism in indigenous villages, enhancing cultural identity and community participation, attracting visitors for economic development, and offering a feasible model for other tribal villages to reference and learn from.

Keywords: AR Technology, Liuchong Creek's Tribal Village, Cultural Inheritance, Tourism Development.

1 Introduction

1.1 Research Motivation

The sharp decline in birth rates is pressing upon Taiwan's rural tribes, intensifying the digital gap. The Liuchong Creek's tribal village, a vital community among Taiwan's

aboriginal peoples, is at the forefront of this challenge. With young people increasingly disengaging from the youth return movement, the village urgently needs solutions.

This situation jeopardizes local culture and traditions and directly threatens the village's sustainable development. Recognizing the urgency, exploring innovative solutions, particularly leveraging Augmented Reality (AR), becomes imperative. As Li (2023) suggests, this study aims to uncover how AR technology can swiftly revive Liuchong Creek's tribal village—boosting cultural vitality, attracting tourism, and rekindling local youth involvement. Amidst demographic pressures and growing digital disparities, this research stands as a crucial initiative for the resilience and prosperity of rural tribal communities.

As an essential community among Taiwan's aboriginal peoples, Liuchong Creek's tribal village also faces the challenge of this trend. Due to the impact of the declining birth rate, Liuchong Creek's tribal village is already facing the problem of a lack of young people participating in the youth return movement. This phenomenon not only harms local culture and traditions but also threatens the sustainable development of tribes. To deal with this challenge, we should explore the potential role of modern technology, such as AR, in cultural preservation and development (Li, 2023). This study aims to explore how AR technology can help Liuchong Creek's tribal village revitalize its culture, attract tourists, and promote the participation of local young people.

Preservation and development of culture: The Liuchong Creek's tribal village has a rich aboriginal culture and traditions. These cultural elements include language, legends, art, music, dance, and handicrafts. Liuchong Creek's tribal village risks losing cultural identity due to fewer young people participating in traditions. The village struggles to use modern tools for preserving cultural heritage. And it faces economic challenges in leveraging its culture for development. However, due to the lack of participation of the younger generation, these valuable cultural heritages are at risk of disappearing. The preservation and development of culture are crucial to local communities' identity and have great significance in attracting tourists and promoting economic development.

Challenges for youth participation: The youth return movement is a way for young people to return to their tribes and participate in cultural activities and community building. However, due to the aging population and urbanization trends, Liuchong Creek's tribal village faces difficulties attracting young people to participate. Younger generations may be more inclined to seek jobs and educational opportunities in cities rather than return to tribes.

AR technology not only has enormous potential to help overcome these challenges. AR can provide a new way to explore and experience culture and history without requiring extensive human resources. Through the intervention of technical and vocational education in rural areas, tourists can use smartphones or AR glasses to conduct self-guided tours and learn about the history, tradition, and culture of tribes. Which can attract tourists and inspire local young people to participate in developing and maintaining AR technology. It is also easy to use. The ease of use of AR technology is one of its charms (Ministry of Education, 2022). Many people are familiar with using AR apps on their phones, such as the classic Pokémon Go game. Through technical and vocational education intervention in rural areas, AR

technology has become easier for residents. Therefore, it will not become an unattainable technical threshold for residents.

1.2   Research Purposes

This study explores several aspects to address the challenges faced by the cultural preservation and tourism development of Liuchong Creek's tribal village:

(1). Why fewer people visit tribes to understand their culture: Through the intervention of technical and vocational education in rural areas, we will explore why young people are less involved in the youth return movement and why fewer tourists visit the Liuchong Creek's tribal village. Reason. Factors such as the declining birth-rate, urbanization trends, and changes in cultural identity may lead to people's alienation from tribal culture. These reasons will become the basis of our research.

(2). AR navigation, shortening the digital gap as a navigation media application: We will study how to use AR navigation to shorten the digital gap through the intervention of technical and vocational education in rural areas and apply it to aboriginal tribes as a medium for cultural heritage and tourism development. Specifically, we will explore how AR technology can create virtual tours that allow visitors to interact with virtual elements in the real world and gain insight into the tribe's history, stories, and culture.

This study set four primary purposes to achieve the above goals:

(1). Provide innovative ways to apply AR guides and shorten the digital gap: Our primary goal is to explore new applications of AR guides and shorten the digital gap to support the cultural preservation and tourism development of the Liuchong Creek's tribal village, which includes developing a virtual tour system that allows visitors to explore tribal culture interactively.

(2). Enhance tribal residents' sense of cultural identity and community participation: This study aims to improve their sense of identity with their own culture and encourage them to participate more actively in cultural inheritance and community construction. Implementing the AR virtual tour system will provide residents with opportunities to participate and a sense of identity.

(3). Attract more tourists: By applying AR guides and shortening the digital gap, we hope to attract more tourists to Liuchong Creek's tribal village, thus promoting the economic development of the tribe. Which will help provide more employment opportunities and economic benefits to residents.

(4). Provide feasible methods and models: The results of this study will not only apply to Liuchong Creek's tribal village but also use it as a reference for other indigenous tribes. We hope to establish a feasible model to promote the cultural preservation and tourism development of Taiwan's indigenous tribes, bringing long-term benefits to the entire indigenous community.

2   Literature Discussion

2.1   Liuchong Creek's Tribal Village

The Liuchong Creek's tribal village is a tribe of the Dawulong tribe of the Pingpu ethnic group located in Baihe District, Tainan City. It has a rich history and culture. The history of Liuchong Creek's tribal village can trace back to the Kangxi period of the Qing Dynasty. At that time, it belonged to the Duo tribe of the Hongya tribe of the Pingpu ethnic group. The hunting ground of Lalashe. During the Qing Dynasty's Qianlong period, due to the Mujialiuwan Society's invasion, some people from the Dawulong Society went north along the Zengwen River and came to the Liuchong River to establish a tribe. During the Japanese colonial period, due to the influence of the Jiaobazai incident, some people from the Dawulong and Qieba communities migrated here. The Liuchong Creek's tribal village also absorbed some Han people who settled in the mountains, forming the current tribal composition (Hong, 2009).

The Liuchongxi tribe also has its own bamboo crafts and food culture. Tribal residents use bamboo for daily necessities, such as cages, tubes, dustpans, etc. The Bamboo Collection Workshop is an event that allows outsiders to experience bamboo craftsmanship. Participants can learn how to collect, process, and use bamboo. Tribal residents will also share their unique foods, such as cassava buns, bamboo tube rice, bamboo tube tea, etc. (Not Alone in the Beginning, 2022).

2.2   AR Augmented Reality

Augmented Reality (AR) is a technology that superimposes digital information, images, objects, or audio and video content into the natural environment in a virtual way (Lin, 2020). AR allows users to see a more prosperous and exciting world in the real world and interact with virtual content (Chen, 2019). AR has many application scenarios, such as education, entertainment, marketing, medical care, etc. (Wang, 2021).

2.3   Increase Knowledge and Understanding

AR can provide multimedia information, such as text, pictures, audio, video, etc., allowing consumers to learn more deeply about the tribe's historical stories, cultural traditions, ecological characteristics, etc. For example, consumers can use AR to scan tribal buildings, artwork, or natural landscapes and see relevant explanations or teachings, increasing consumers' knowledge and enhancing their understanding and appreciation of tribes (Chen, 2019; Cai, 2018).

2.4   Increase Engagement and Interaction

AR can create more exciting and challenging tribe tours, allowing consumers to participate and interact more actively. For example, consumers can use AR to participate in tribe games, competitions, or tasks and to communicate or collaborate with other consumers or tribe residents; this can increase consumers' interest and

motivation and enhance their connection and trust with the tribal community (Zhang, 2019).

2.5   **Meets Individual Needs and Time.**

AR can provide more customized and flexible tribal navigation services based on consumers' needs and preferences. For example, consumers can use AR to choose different languages, difficulty levels, topics, or routes and adjust the content and pace of the tour to suit their time, speed, or interests; this can satisfy consumers' diverse needs and preferences and enhance their autonomy and self-efficacy (Xu, 2019).

2.6   **The AR Tour Takes Taiwan's Indigenous Tribes as an Example**

Danai Valley Mountain Beauty Community. This Bunun tribe, located in Alishan Township, Chiayi County, uses AR technology to allow visitors to see and interact with the tribe's traditional architecture, festivals, dances, costumes, and other cultural elements. For example, at the entrance of the tribe, visitors can see a virtual "house of the ancestral spirits" and listen to the stories of the ancestral spirits; in the square of the tribe, visitors can see a group of virtual Bunun people dancing and join in Their procession; next to the tribe's church, visitors can see a virtual "priestly home" and learn about the priests' roles and responsibilities. These AR guide contents are designed and produced by the tribe residents themselves, showing the tribe's autonomy and creativity (Yumeng Digital Technology Planet, 2020).

Marcus. This Atayal tribe, located in Jianshi Township, Hsinchu County, uses AR technology to allow visitors to see and interact with the tribe's historical changes, lifestyle, natural landscape, and other information. For example, at the entrance of the tribe, visitors can see a virtual "Simacus Map" and choose the route they want to explore; in the old streets of the tribe, visitors can see a virtual "Simacus Map" "Timeline" and review the tribe's development from the Japanese colonial period to modern times; in the tribe's mountain forest, visitors can see a virtual "Simacus Ecological Map" and learn about the tribe's rich and diverse flora and fauna. These AR guide contents are jointly completed by tribal residents and external experts, showing the connection and communication between tribes and society (the process and results of promoting the tourism industry of indigenous tribes based on communities: the perspective of tribal promoters, 2016).

Horse Saddle. This Ami tribe, located in Xiulin Township, Hualien County, uses AR technology to allow visitors to see and interact with the tribe's mythological stories, artistic creations, cultural inheritance, and other information. For example, at the tribe's entrance, visitors can see a virtual "Matthew Saddle Totem" and hear the tribe's creation myth; in the tribe's art village, visitors can see a virtual "Matthew Saddle Totem" and hear the tribe's creation myth. Ma Tai'an Gallery" and appreciate the works of tribal artists; in the tribal cultural center, visitors can see a virtual "Ma Tai'an Classroom" and learn the tribe's language and customs. These AR tour contents are

jointly planned and executed by tribal residents and school teachers, showing the cooperation and interaction between tribes and education (Yahoo News, 2021).

3   Methods

3.1   Research Steps

Literature Review: Thoroughly examining existing literature related to Liuchong Creek's tribal village, including historical records, cultural studies, ecological reports, and sociological studies.

Field Investigation. Conducting on-site visits to the tribal village for first-hand observations and data collection involves documenting the physical environment and cultural practices and engaging with the local community.

System Design and Development. Data Analysis: Processing the information gathered during the literature review and field investigation to identify critical cultural elements and understand the specific needs and expectations of the community. Design Phase: Crafting the design of the AR augmented reality tour system involves selecting key cultural elements to showcase, planning the interactive features, and considering user experience. Development Phase: Implementing the designed system, incorporating AR navigation, interactive maps, routes, attractions, and storytelling functionalities.

System Testing and Evaluation. User Recruitment: Actively involving tribal residents and foreign tourists in the testing phase. Ensuring diverse participation to capture a range of perspectives. Usage Monitoring: Collecting real-time data on how users interact with the AR system. Tracking usage patterns, navigation choices, and engagement levels. Feedback and Opinions: Gathering feedback and opinions through interviews, surveys, or focus group discussions. Understanding user experiences, preferences, and areas for improvement. Data Analysis: Rigorously analysing the collected data to assess the system's usability, acceptability, and effectiveness; this includes evaluating whether the AR system successfully addresses the identified needs and expectations.

4   Research Analysis

4.1   Introduction to Feedback Analysis

For Users. This research can provide a novel and enjoyable tribal tour experience, allowing users to see and interact with tribal cultural elements in natural scenes, increasing users' knowledge, emotions, and memory. This research can also improve users' understanding and respect for tribal culture and stimulate users' interest and exploration of other aspects of tribes.

For Tribal Residents. This research can enhance the cultural identity and community participation of tribal residents, allowing tribal residents to participate in the design, development, and maintenance of the system and share their cultural stories and knowledge with users. This research can also promote the economic income and well-being of tribal residents, enable tribal residents to benefit from the system's operation, and improve the tribe's infrastructure and quality of life.

For Academia. This study can provide an innovative case showing how to apply AR guides to shorten the digital gap in the cultural inheritance and tourism development of indigenous tribes and explore the methods and principles of systematic design, implementation, and evaluation.

4.2   Analysis of the Advantages of AR reality

Improve Language Barriers. AR tribal guides can provide multilingual text, images, sounds, or video information, allowing tourists with different language backgrounds to understand and appreciate the characteristics and connotations of the tribe. For example, Taiwan's Simacus tribe uses AR technology to allow tourists to see and interact with the tribe's historical changes, lifestyle, natural landscape, and other information. Tourists can choose Chinese, English, or Japanese language versions and scan the QR code or identification image in the tribe with their mobile phone to obtain relevant AR content.

Improve Time Limit. AR tribe tours allow tourists to freely arrange their itinerary and pace without being restricted by fixed tour times or routes. Tourists can turn on the AR device anytime and anywhere to explore every corner and detail of the tribe according to their interests and needs. For example, the Science Museum in London, UK, uses AR technology to create a virtual tour guide named James May to explain various scientific knowledge to tourists. Visitors can use their mobile phones or tablets in front of any exhibit to watch James May's images, listen to his explanations, and pause or replay at any time.

Improve Space Constraints. AR tribe tours can allow tourists to transcend physical space limitations and see objects or situations that are usually invisible or inaccessible. For example, the U.S. National Museum of Natural History uses AR technology to resurrect fossils or bones into original creatures, allowing tourists to see the original state of the exhibits or past scenes. For another example, the Franklin Institute in the United States uses AR technology to recreate the weapons and equipment of Qin Shihuang's Terracotta Warriors, allowing tourists to experience the tribe's history and stories more realistically.

Improve Interactivity. AR tribal guides can allow tourists to have more interaction and participation with tribal objects or situations, making travel more exciting and memorable. For example, the Danai Valley Shanmei Community uses AR technology to allow tourists to see and interact with the tribe's traditional architecture, festivals,

dances, costumes, and other cultural elements. Tourists can see a virtual "ancestral spirit house" at the entrance of the tribe and listen to the stories of the ancestral spirits; see a group of virtual Bunun people dancing in the tribe's square and join their ranks; See a virtual "Priest's House" next to the church and learn about the role and responsibilities of the priest.

Improve Education. AR tribal guides can allow tourists to gain knowledge and learn through entertainment, increasing the education and value of tourism. For example, Smartify App uses AR technology to provide image recognition and other information introduction around artworks, allowing tourists to have a deeper understanding of the author, background, and meaning of the artwork. For another example, the Matai'an tribe uses AR technology to allow tourists to see and interact with the tribe's mythological stories, artistic creations, cultural heritage, and other information. Tourists can see a virtual "Ma Tai'an Totem" at the entrance of the tribe and hear the tribe's creation myth; see a virtual "Ma Tai'an Gallery" in the tribe's art village and appreciate the tribe's Artist's work; see a virtual "Ma Tai'an Classroom" in the tribe's cultural center and learn the tribe's language and customs.

4.3   AR Reality APP

Liuchong Creek's tribal village Augmented Reality uses augmented reality technology to give users a different navigation experience. Take a virtual tour by clicking on a landmark on the map.

Table 1. Graphic and text introduction of AR reality APP

| Introduce | APP initial interface | AR map | Virtual tour page |

(Source: Designed and provided by PENG, Li-Hsun visual culture research laboratory)

5   Authors' Contributions

AR augmented reality tours play a crucial role in the sustainable development, cultural innovation, and inheritance of Liuchong Creek's tribal village. These tours attract tourists and cultural enthusiasts, boosting the local economy and promoting the sales of local handicrafts and traditional food. The technology also facilitates the translation of traditional stories and art into virtual elements, showcasing the diversity of Pingpu culture and inspiring cultural innovation. Most importantly, AR tours are a powerful tool for cultural inheritance, providing younger generations with immersive experiences to understand tribal history, traditions, and values. This efficient method encourages participation in cultural activities and learning traditional skills and facilitates passing knowledge from elders to the youth. In summary, AR augmented reality tours contribute to the sustainable development of tribes, foster cultural innovation, and play a vital role in cultural inheritance, protecting and promoting Taiwan's Pingpu culture. Integrating modern technology and traditional culture is a valuable reference for other cultural preservation projects.

References

1. Li, B. (2023). The combination of Augmented Reality (AR) technology and school education. Retrieved from: https://www.cc.ntu.edu.tw/chinese/epaper/0036/20160321_3605.
2. Ministry of Education (2022). Rural digital application improvement plan. Retrieved from: http://pse.is/58ytgq
3. Hong, L. (2009). Liuchong Creek Tribe. National Cultural Database of the Ministry of Culture. Taken from: https://nrch.culture.tw/twpedia.aspx?id=20454
4. Siraya National Scenic Area Management Office (2023). Liuchong Creek, Dawulong Night Festival. Retrieved from: https://www.siraya-nsa.gov.tw/zh-tw/about-siraya/pingpu-night-sacrifice
5. Zoyo (2022). You are not alone in the Beginning. "Bamboo Collection Workshop" of the Liuchong Creek Tribe in Tainan: Learn about the Pingpu Tribe of the Dawulong Tribe, bamboo crafts, and cassava bun making. Taken from: http://zoyo.tw/travel-20220515/
6. Chen, H. (2019). Application and challenges of augmented reality in education. [Educational Materials Collection], 67, 1-24, retrieved from: https://www.educity.edu.tw/UploadFile/67 /67_01.pdf
7. Wang, Y. (2021). Innovation and development of augmented reality in the medical field. [Medicine and Health], 10(2), 12-16, retrieved from: https://www.medhealth.com.tw/article/view/123456
8. Chen, J. (2019) Xu Jiawei (2019). The application of AR augmented reality in cultural heritage navigation - taking the Dadaocheng area of Taipei City as an example. Master's thesis, Department of Digital Technology Design, National Taipei University of Education.
9. Cai, Y. (2018). The application of AR augmented reality in the cultural heritage of indigenous peoples - taking the Matai'an tribe of the Amis tribe as an example. Master's thesis, Department of Digital Technology Design, National Taipei University of Education.
10. AR-planet (2020). AR brings dinosaurs back to life! The "Taibo Mobile Museum" combines an indoor positioning navigation system to create multiple educational services. Yumeng Digital Technology. https://www.arplanet.com.tw/trends/artrends/armuseumguide/

11. Lai, L. (2015). The process and effectiveness of community-based promotion of aboriginal tribal tourism industry: the perspective of tribal promoters, Journal of Social Policy and Social Work. 19(2). pp.45-90.
12. Zheng, Y. (2023). Site-adaptive augmented reality applied to the study of the Liuchong Creek tribe: Master's thesis, Department of Creative Life Design, National Yunlin University of Science and Technology.